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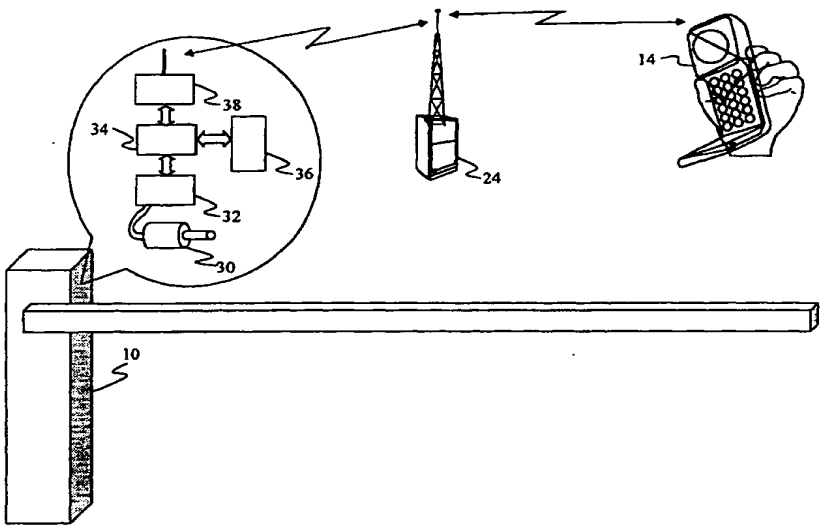

(57) Abstract: A cellular telephone operated access control system and methodology including an automatic gate (10), a gate operating subsystem (34), a cellular communication subsystem (38), at least one remotely identifiable remote cellular terminal (14) employing terminal identification information uniquely associated with the remote cellular terminal (14) and an access-permitting database (36) associated with the gate operating subsystem (34) and comprising at least one remote cellular terminal identification information wherein the gate operating subsystem (34) receives the terminal identification information from the remote terminal (14) via the cellular communication subsystem (38), verifies that the access-permitting database (36) contains this terminal identification information and then operates the automatic gate accordingly.

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METHOD AND APPARATUS FOR SECURE ACCESS TO HOMES, OFFICES, PROFESSIONAL BUILDINGS AND/OR REMOTE MACHINERY AND EQUIPMENT

FIELD OF THE INVENTION

The present invention relates to systems and methods for controlling access to premises using cellular telephones.

BACKGROUND OF THE INVENTION

The following U.S. Patents are believed to represent the current state of the art:

U.S. Patents 6,308,062; 5,297,183; 5,325,419; 5,333,178; 5,371,901; 5,551,068; 5,553,312; 5,561,446; 5,649,005; 5,793,762; 5,873,031; 5,878,343.

SUMMARY OF THE INVENTION

The present invention seeks to provide systems and methods to control access into premises by using a cellular telephone.

There is thus provided in accordance with a preferred embodiment of the present invention a cellular telephone operated access control system containing: an automatic gate, a gate operating subsystem operating the automatic gate, a cellular communication subsystem connected with the gate operating subsystem, at least one remotely identifiable remote cellular terminal employing terminal identification information uniquely associated with the remote cellular terminal, and an access-permitting database associated with the gate operating subsystem and containing the at least one remote cellular terminal identification information, wherein the gate operating subsystem being operative to receive the terminal identification information from the remote terminal via the cellular communication subsystem, query the access-permitting database for the terminal identification information and operate the automatic gate based on the result of the query.

There is further provided in accordance with a preferred embodiment of the present invention a cellular telephone operated access control system containing an automatic gate, a gate operating subsystem operating the automatic gate, a cellular communication subsystem connected with the gate operating subsystem, at least one remotely identifiable remote cellular terminal employing terminal identification

information uniquely associated with the remote cellular terminal, an access-permitting database associated with the gate operating subsystem and containing the at least one remote cellular terminal identification information, the gate operating subsystem being operative to receive the terminal identification information from the remote terminal via the cellular communication subsystem, query the access-permitting database for the terminal identification information and operate the automatic gate based on the result of the query; and a remote administration subsystem operative to manage the access-permitting database.

There is additionally provided in accordance with a preferred embodiment of the present invention a cellular telephone operated access control system containing an automatic gate, a gate operating subsystem operating the automatic gate, a cellular communication subsystem connected with the gate operating subsystem, at least one remotely identifiable remote cellular terminal employing terminal identification information uniquely associated with the remote cellular terminal, an access-permitting database associated with the gate operating subsystem and containing the at least one remote cellular terminal identification information, the gate operating subsystem being operative to receive the terminal identification information from the remote terminal via the cellular communication subsystem, query the access-permitting database for the terminal identification information and operate the automatic gate based on the result of the query, a remote administration subsystem operative to manage the access-permitting database; and an Internet web site enabling access via the Internet to the remote administration subsystem.

There is further provided in accordance with a preferred embodiment of the present invention a cellular telephone operated access control method, which includes employing at least one remotely identifiable remote cellular terminal, dialing a telephone number of a cellular communication subsystem connected with a gate operating subsystem using the remotely identifiable remote cellular terminal, the gate operating subsystem receiving a remote cellular terminal identification information uniquely associated with the remote cellular terminal via the cellular communication subsystem, the gate operating subsystem querying an access-permitting database for the received terminal identification information and the gate operating subsystem operating an automatic gate based on the result of the query.

There is still further provided in accordance with a preferred embodiment of the present invention a cellular telephone operated access control method, which also includes managing the access-permitting database.

There is even further provided in accordance with a preferred embodiment of the present invention a cellular telephone operated access control method, which also includes managing the access-permitting database via the Internet.

Further in accordance with a preferred embodiment of the present invention the cellular communication subsystem is a cellular modem; alternatively the cellular communication subsystem is a cellular telephone.

Still further in accordance with a preferred embodiment of the present invention the remote cellular terminal identification information comprises caller ID. Alternatively and in addition, the remote cellular terminal identification information comprises a password entered via the remote cellular terminal, alternatively the password is entered via the remote cellular telephone, as a further alternative the gate operating subsystem comprises a keypad and the password is entered via the gate operating subsystem keypad.

Further in accordance with a preferred embodiment of the present invention the password is based on the remote cellular terminal identification information.

Still further in accordance with a preferred embodiment of the present invention the access-permitting database comprises a log containing at least one access permission operation.

Even further in accordance with a preferred embodiment of the present invention the access-permitting database is operative to receive at least one database instruction via cellular short message service.

Further in accordance with a preferred embodiment of the present invention the access-permitting database is operative to send at least one database query result via cellular short message service.

Also in accordance with a preferred embodiment of the present invention the at least one database instruction comprises a new remote cellular terminal identification information.

Still further in accordance with a preferred embodiment of the present invention the at least one database instruction comprises deletion of a remote cellular terminal identification information.

Even further in accordance with a preferred embodiment of the present invention the at least one database query result comprises a log comprising at least one access permission operation.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Figs. 1A, 1B and 1C are simplified illustrations of three preferred embodiments of the present invention;

Fig. 2 is a simplified block diagram of a preferred embodiment of the automatic gate of Fig. 1;

Fig. 3A is a simplified illustration of a preferred embodiment of an access-permitting database;

Fig. 3B is a simplified illustration of a preferred embodiment of an log file of the operations of the automatic gate;

Figs. 4A and 4B taken together are a simplified flow-chart of the process of operating an automatic gate using a cellular telephone;

Fig. 5 is a simplified block diagram of a preferred embodiment of the present invention comprising a central access-permitting database;

Fig. 6 is a simplified block diagram of another preferred embodiment of the present invention comprising a central access-permitting database; and

Fig. 7 is a simplified block diagram of a central administration server being accessed via the Internet.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1A, which is a simplified illustration of a preferred embodiment of the present invention. As seen in Fig. 1A, an automatic gate 10 is operated by a user 12 using a cellular telephone 14. The user 12, using the telephone 14, dials a telephone number that is associated with the gate 10. The dialing command is transmitted by the telephone 14 to a base station 16 of a cellular telephone service (not shown) as indicated by an arrow 18. The cellular telephone service transmits a ringing signal to the automatic gate 10 as indicated by an arrow 20. The ringing signal is accompanied by a caller number identification, also known as caller identification, CLI, automatic number identification and ANI. The gate 10 then determines, as described hereinbelow in the description of Figs. 4A and 4B, based on the caller identification, whether to permit access.

Reference is now made to Fig. 1B, which is a simplified illustration of another preferred embodiment of the present invention where the cellular telephone service 22 of Fig. 1A communicates, respectively, with the cellular telephone 14 and with the automatic gate 10 via different base stations 24 and 26. The gate 10 then determines, as described hereinbelow in the description of Figs. 4A and 4B, based on the caller identification, whether to permit access.

Reference is now made to Fig. 1C, which is a simplified illustration of yet another preferred embodiment of the present invention where the automatic gate 10 is connected to a telephone service 28 that is different from the cellular telephone service 22 serving the cellular telephone 14. The telephone service 28 can be a cellular telephone service or a wireline telephone service, as seen in Fig. 1C. The gate 10 then determines, as described hereinbelow in the description of Figs. 4A and 4B, based on the caller identification, whether to permit access.

It is appreciated that the automatic gate 10 can be any type of gate or door or barrier or any other physical access device.

Reference is now made to Fig. 2, which is a simplified block diagram of a preferred embodiment of the automatic gate of Fig. 1. As seen in Fig. 2, the automatic gate 10 preferably comprises a motor 30, a motor driver 32, a processor 34, a memory 36 and a line interface 38. The motor 30 is typically an electric motor, which is operative to open and to close the gate 10. The motor driver 32 typically controls the

electric current that operates the motor 30. The processor 34 controls the line interface 38 and the motor driver 32. The line interface 38 typically comprises a cellular modem. Alternatively the line interface comprises a cellular telephone. As a further alternative, if the automatic gate is connected to the wireline telephone service 28 of Fig. 1C, the line interface 38 is a wireline line interface, preferably a telephone line modem or a regular telephone line interface with a caller ID decoder. The memory 36, typically a non-volatile memory, preferably a flash memory, contains an access-permitting database. The automatic gate is typically provided with an electric power supply (not shown). The gate 10 then determines, based on the caller identification, whether to permit access as described hereinbelow in the description of Figs. 4A and 4B.

Reference is now made to Fig. 3A, which is a simplified illustration of a preferred embodiment of an access-permitting database 40. As seen in Fig. 3A, the access-permitting database 40 typically comprises a list of caller identification numbers 42. Optionally the access-permitting database also comprises a password 44 for each of the caller identification numbers.

Reference is now made to Fig. 3B, which is a simplified illustration of a preferred embodiment of a log file 46 of the operations of the automatic gate 10 (Fig. 2). As seen in Fig. 3B, the log file 46 typically comprises a list of access permission records 47, each typically comprising a caller identification number 42, a time stamp 48, and an access status indicator 49. A time stamp 48 typically comprises a full date and time at which access to the automatic gate 10 was requested. An access status indicator 49 typically records the acceptance or rejection of access requests.

Reference is now made to Figs. 4A and 4B, which, taken together, are a flow chart of the process of operating an automatic gate. As seen in Fig. 4A, the process begins at block 50, when the user 12 (Fig. 1A), employing his cellular phone 14 (Fig. 1A), dials the telephone number of the automatic gate 10 (Fig. 2). At block 52, the telephone service sends a ringing signal to the automatic gate 10 (Fig. 2), accompanied by the Caller ID number of the calling cellular telephone 14 (Fig. 1A). At block 54, the line interface 38 (Fig. 2) receives the ringing signal and decodes the Caller ID. The processor 34 (Fig. 2) receives the Caller ID from the line interface 38 (Fig. 2). At block 56 the processor 34 (Fig. 2) searches the access-permitting database 40 (Fig. 3A) for a matching Caller ID 42 (Fig. 3A). If a matching Caller ID 42 (Fig. 3A) is not found in

block 58, in block 60 an access permission record 47 (Fig. 3B) with access status 49 (Fig. 3B) of rejected is entered into the log file 46 (Fig. 4B) and the process ends.

If a matching Caller ID 42 (Fig. 3A) is found in block 58, the process continues on Fig. 4B. In block 62, the access-permitting database 40 (Fig. 3A) is queried to ascertain whether a password 44 (Fig. 3A) is required. If a password 44 (Fig. 3A) is not required, then in block 64 an access permission record 47 (Fig. 3B) with access status 49 (Fig. 3B) of accepted is entered into the log file 46 (Fig. 3B). The gate 10 (Fig. 2) is then operated in block 66 and the process ends.

If a password 44 (Fig. 3A) is required, in block 68 the call is answered and a password is requested from the user 12 (Fig. 1A), typically verbally. In block 70, the user entered password is checked against the password 44 (Fig. 3A) in the access-permitting database 40 (Fig. 3A). If the user entered password does match the password 44 (Fig. 3A) in the access-permitting database 40 (Fig. 3A), then in block 64 an access permission record 47 (Fig. 3B) with access status 49 (Fig. 3B) of accepted is entered into the log file 46 (Fig. 3B). The gate 10 (Fig. 2) is then operated in block 66 and the process ends.

If the user entered password does not match the password 44 (Fig. 3A) in the access-permitting database 40 (Fig. 3A) in block 70, in block 72 an access permission record 47 (Fig. 3B) with access status 49 (Fig. 3B) of rejected is entered into the log file 46 (Fig. 4B) and the process ends.

It is appreciated that if a password 44 (Fig. 3A) is not required then the call from the cellular telephone 14 (Fig. 1A) to the automatic gate 10 (Fig. 2) is not answered and there is, preferably, no charge for this call.

Reference is now made to Fig. 5, which is a simplified block diagram of a preferred embodiment of the present invention comprising a central access-permitting database. As seen in Fig. 5, an access-permitting database 78, similar in structure and function to the access permitting database 40 (Fig. 3A), is hosted in a central server 80, which serves one or a multiplicity of automatic gates, instead of in each individual automatic gate. The user 12 (Fig. 1A) dials the number of the central server 80 and the call follows the arrows designated by reference numerals 82 and 84 to a line interface 86 connected to the central server 80. The line interface 86 receives and decodes the caller ID and transfers it to the central server 80. The central server 80, executing the

process shown and described with reference to Figs. 4A and 4B hereinabove, determines to which automatic gate access has been requested, and if access permission is granted, dials the number of that automatic gate to operate it. The call follows the arrows designated by reference numerals 88 and 90 and is received by the automatic gate 10. The automatic gate 10, executing the process shown and described with reference to Figs. 4A and 4B hereinabove, verifies that the call is originated by the central server and operates the gate. It is appreciated that in this case the access-permitting database 40 (Fig. 3A) in the automatic gate 10 contains only the caller ID of the central server. It is also appreciated that, if a password is not required, there is, preferably, no charge for these procedures as well. It is appreciated that a backup central server 92 can be provided for improved availability. It is also appreciated that a reporting system 94 can be connected to the central server 80 to produce various reports It is further appreciated that the central server 80 can be interfaced to other systems 96, for example to provide remote administration, for example by connecting the central server 80 to the Internet to enable modifications of the access-permitting database 78 via the Internet 98. Alternatively, the central server 80 can be connected to a cellular short message service (SMS) to receive modification instructions for the access-permitting database using SMS messages.

Reference is now made to Fig. 6, which is a simplified block diagram of another preferred embodiment of the present invention comprising a central access-permitting database. As seen in Fig. 6 the central server is connected to the telephone network using wireline data communication facility 100 rather than cellular facility.

Reference is now made to Fig. 7, which is a simplified block diagram of a central administration server being accessed via the Internet. It is appreciated that the access-permitting database 40 (Fig. 3A) can reside in the memory 36 of each gate and can be updated, using SMS messages, from any cellular telephone capable of sending SMS messages, or from the central server 80, wherein the central server is updated via the Internet.

It is appreciated that each automatic gate 10 can send access log records to the central server via SMS messages, either for each gate operation or in batch mode. Batch mode reporting can be initiated by each automatic gate 10 or on by polling by the central server 80.

As seen in Fig. 7 the cellular terminal 14, the automatic gate 10 and the central server 80 may be connected to different networks.

It is appreciated that the present invention is not limited to operating an automatic gate as described in detail hereinabove but can also be used for operating any other suitable automatic gate, for example, parking gates, parking lot access devices, home access devices, or for turning on and off remote machinery as well as operating other electronic devices.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described herein above. Rather the scope of the present invention includes both combinations and subcombinations of the various features described hereinabove as well as variations and modifications which would occur to persons skilled in the art upon reading the specifications and which are not in the prior art.

CLAIMS

1. A cellular telephone operated access control system comprising:

an automatic gate;

a gate operating subsystem operating said automatic gate;

a cellular communication subsystem connected with said gate operating subsystem;

at least one remotely identifiable remote cellular terminal employing terminal identification information uniquely associated with said remote cellular terminal; and

an access-permitting database associated with said gate operating subsystem and comprising at least one said remote cellular terminal identification information,

said gate operating subsystem being operative to receive said terminal identification information from said remote terminal via said cellular communication subsystem, query said access-permitting database for said terminal identification information and operate said automatic gate based on the result of said query.

2. A cellular telephone operated access control system comprising:

an automatic gate;

a gate operating subsystem operating said automatic gate;

a cellular communication subsystem connected with said gate operating subsystem;

at least one remotely identifiable remote cellular terminal employing terminal identification information uniquely associated with said remote cellular terminal;

an access-permitting database associated with said gate operating subsystem and comprising at least one said remote cellular terminal identification information, said gate operating subsystem being operative to receive said terminal identification information from said remote terminal via said cellular communication subsystem, query said access-permitting database for said terminal identification information and operate said automatic gate based on the result of said query; and

a remote administration subsystem operative to manage said access-permitting database.

3. A cellular telephone operated access control system comprising:

an automatic gate;

a gate operating subsystem operating said automatic gate;

a cellular communication subsystem connected with said gate operating subsystem;

at least one remotely identifiable remote cellular terminal employing terminal identification information uniquely associated with said remote cellular terminal;

an access-permitting database associated with said gate operating subsystem and comprising at least one said remote cellular terminal identification information, said gate operating subsystem being operative to receive said terminal identification information from said remote terminal via said cellular communication subsystem, query said access-permitting database for said terminal identification information and operate said automatic gate based on the result of said query;

a remote administration subsystem operative to manage said access-permitting database; and

an Internet web site enabling access via the Internet to said remote administration subsystem.

4. A cellular telephone operated access control system according to claim 1 and wherein said cellular communication subsystem is a cellular modem.

5. A cellular telephone operated access control system according to claim 1 and wherein said cellular communication subsystem is a cellular telephone.

6. A cellular telephone operated access control system according to claim 1 and wherein said remote cellular terminal identification information comprises caller ID.

7. A cellular telephone operated access control system according to claim 1 and wherein said remote cellular terminal identification information comprises password entered via said remote cellular terminal.

8. A cellular telephone operated access control system according to claim 7 and wherein said password comprises keypad entry via said remote cellular telephone.

9. A cellular telephone operated access control system according to claim 7 and wherein said gate operating subsystem comprises a keypad and wherein said password comprises keypad entry via said gate operating subsystem keypad.

10. A cellular telephone operated access control system according to claim 8 and wherein said password is based on said remote cellular terminal identification information.

11. A cellular telephone operated access control system according to claim 9 and wherein said password is based on said remote cellular terminal identification information.

12. A cellular telephone operated access control system according to claim 9 and wherein said access-permitting database comprises a log of at least one access permission operation.

13. A cellular telephone operated access control system according to claim 1 and wherein said access-permitting database is operative to receive at least one database instruction via cellular short message service.

14. A cellular telephone operated access control system according to claim 1 and wherein said access-permitting database is operative to send at least one database query result via cellular short message service.

15. A cellular telephone operated access control system according to claim 13 and wherein said at least one database instruction comprises a new remote cellular terminal identification information.

16. A cellular telephone operated access control system according to claim 13 and wherein said at least one database instruction comprises deletion of a remote cellular terminal identification information.

17. A cellular telephone operated access control system according to claim 14 and wherein said at least one database query result comprises a log of at least one access permission operation.

18. A cellular telephone operated access control system according to claim 2 and wherein said cellular communication subsystem is a cellular modem.

19. A cellular telephone operated access control system according to claim 2 and wherein said cellular communication subsystem is a cellular telephone.

20. A cellular telephone operated access control system according to claim 2 and wherein said remote cellular terminal identification information comprises caller ID.

21. A cellular telephone operated access control system according to claim 2 and wherein said remote cellular terminal identification information comprises password entered via said remote cellular terminal.

22. A cellular telephone operated access control system according to claim 21 and wherein said password comprises keypad entry via said remote cellular telephone.

23. A cellular telephone operated access control system according to claim 21 and wherein said gate operating subsystem comprises a keypad and wherein said password comprises keypad entry via said gate operating subsystem keypad.

24. A cellular telephone operated access control system according to claim 22 and wherein said password is based on said remote cellular terminal identification information.

25. A cellular telephone operated access control system according to claim 23 and wherein said password is based on said remote cellular terminal identification information.

26. A cellular telephone operated access control system according to claim 23 and wherein said access-permitting database comprises a log of at least one access permission operation.

27. A cellular telephone operated access control system according to claim 2 and wherein said access-permitting database is operative to receive at least one database instruction via cellular short message service.

28. A cellular telephone operated access control system according to claim 2 and wherein said access-permitting database is operative to send at least one database query result via cellular short message service.

29. A cellular telephone operated access control system according to claim 27 and wherein said at least one database instruction comprises a new remote cellular terminal identification information.

30. A cellular telephone operated access control system according to claim 27 and wherein said at least one database instruction comprises deletion of a remote cellular terminal identification information.

31. A cellular telephone operated access control system according to claim 28 and wherein said at least one database query result comprises a log of at least one access permission operation.

32. A cellular telephone operated access control system according to claim 3 and wherein said cellular communication subsystem is a cellular modem.

33. A cellular telephone operated access control system according to claim 3 and wherein said cellular communication subsystem is a cellular telephone.

34. A cellular telephone operated access control system according to claim 3 and wherein said remote cellular terminal identification information comprises caller ID.

35. A cellular telephone operated access control system according to claim 3 and wherein said remote cellular terminal identification information comprises password entered via said remote cellular terminal.

36. A cellular telephone operated access control system according to claim 7 and wherein said password comprises keypad entry via said remote cellular telephone.

37. A cellular telephone operated access control system according to claim 35 and wherein said gate operating subsystem comprises a keypad and wherein said password comprises keypad entry via said gate operating subsystem keypad.

38. A cellular telephone operated access control system according to claim 36 and wherein said password is based on said remote cellular terminal identification information.

39. A cellular telephone operated access control system according to claim 37 and wherein said password is based on said remote cellular terminal identification information.

40. A cellular telephone operated access control system according to claim 37 and wherein said access-permitting database comprises a log of at least one access permission operation.

41. A cellular telephone operated access control system according to claim 3 and wherein said access-permitting database is operative to receive at least one database instruction via cellular short message service.

42. A cellular telephone operated access control system according to claim 3 and wherein said access-permitting database is operative to send at least one database query result via cellular short message service.

43. A cellular telephone operated access control system according to claim 41 and wherein said at least one database instruction comprises a new remote cellular terminal identification information.

44. A cellular telephone operated access control system according to claim 41 and wherein said at least one database instruction comprises deletion of a remote cellular terminal identification information.

45. A cellular telephone operated access control system according to claim 42 and wherein said at least one database query result comprises a log of at least one access permission operation.

46. A cellular telephone operated access control system according to claim 42 and wherein said Internet web site is operative to request a user name and a password to enable access to said remote administration subsystem.

47. A cellular telephone operated access control method comprising:
employing at least one remotely identifiable remote cellular terminal;

dialing a telephone number of a cellular communication subsystem connected with a gate operating subsystem using said remotely identifiable remote cellular terminal;

said gate operating subsystem receiving a remote cellular terminal identification information uniquely associated with said remote cellular terminal via said cellular communication subsystem;

said gate operating subsystem querying an access-permitting database for said received terminal identification information; and

said gate operating subsystem operating an automatic gate based on the result of said query.

48. A cellular telephone operated access control method comprising:

employing at least one remotely identifiable remote cellular terminal;

dialing a telephone number of a cellular communication subsystem connected with a gate operating subsystem using said remotely identifiable remote cellular terminal;

said gate operating subsystem receiving a remote cellular terminal identification information uniquely associated with said remote cellular terminal via said cellular communication subsystem;

said gate-operating subsystem querying an access-permitting database for said received terminal identification information;

said gate operating subsystem operating an automatic gate based on the result of said query; and

managing said access-permitting database.

49. A cellular telephone operated access control method comprising:

employing at least one remotely identifiable remote cellular terminal;

dialing a telephone number of a cellular communication subsystem connected with a gate operating subsystem using said remotely identifiable remote cellular terminal;

said gate operating subsystem receiving a remote cellular terminal identification information uniquely associated with said remote cellular terminal via said cellular communication subsystem;

said gate-operating subsystem querying an access-permitting database for said received terminal identification information;

said gate operating subsystem operating an automatic gate based on the result of said query.

Managing said access-permitting database via the Internet.

50. A cellular telephone operated access control method according to claim 47 and wherein said receiving remote cellular terminal identification information comprises receiving a password entered via said remote cellular terminal.

51. A cellular telephone operated access control method according to claim 50 and wherein said receiving a password comprises entering the password using a keypad comprised within said remote cellular telephone.

52. A cellular telephone operated access control method according to claim 50 and wherein said gate operating subsystem comprises a keypad and wherein said password comprises keypad entry via said gate operating subsystem keypad.

53. A cellular telephone operated access control method according to claim 47 and wherein said operating said automatic gate comprises logging of at least one gate operation.

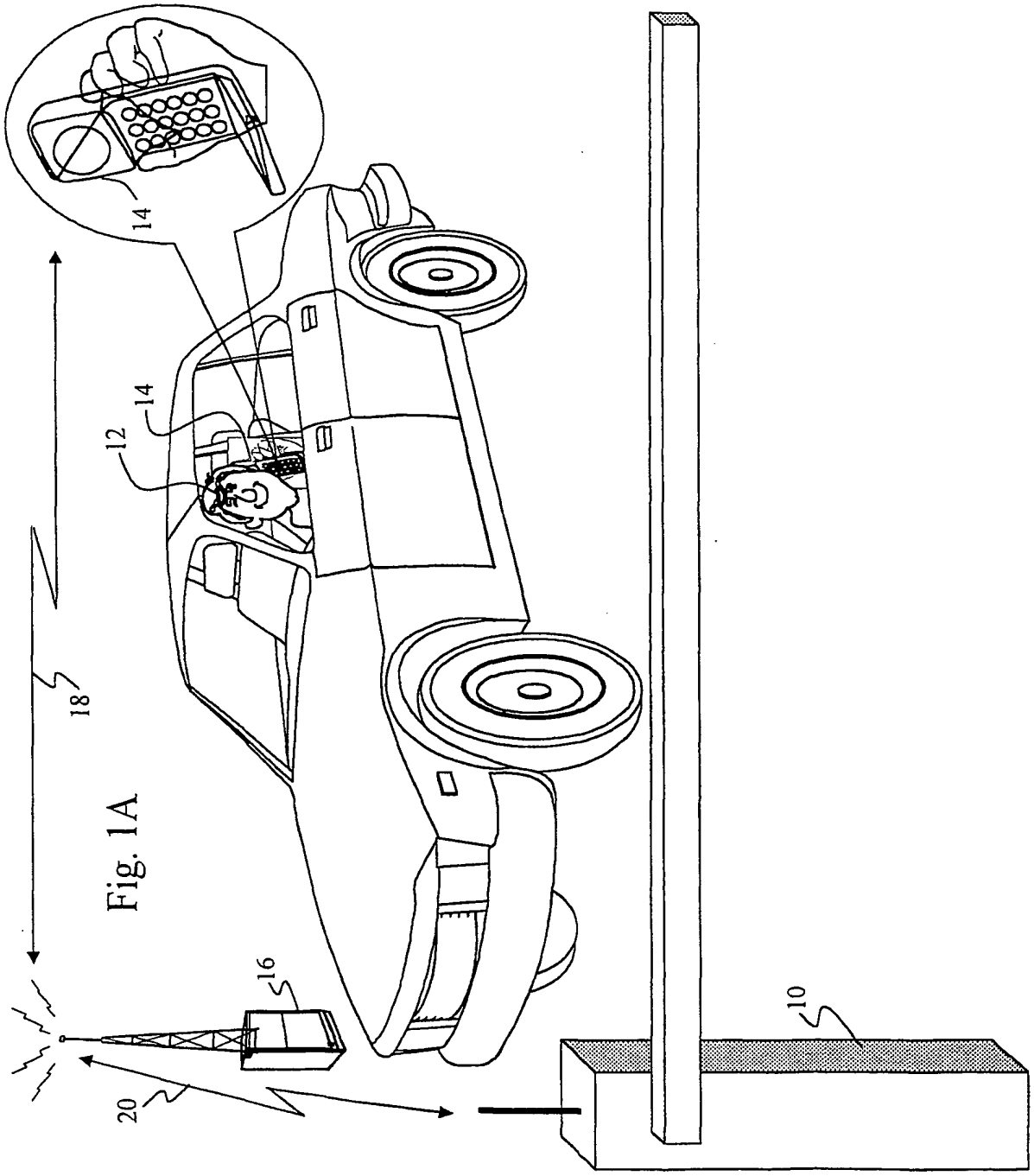


Fig. 1A

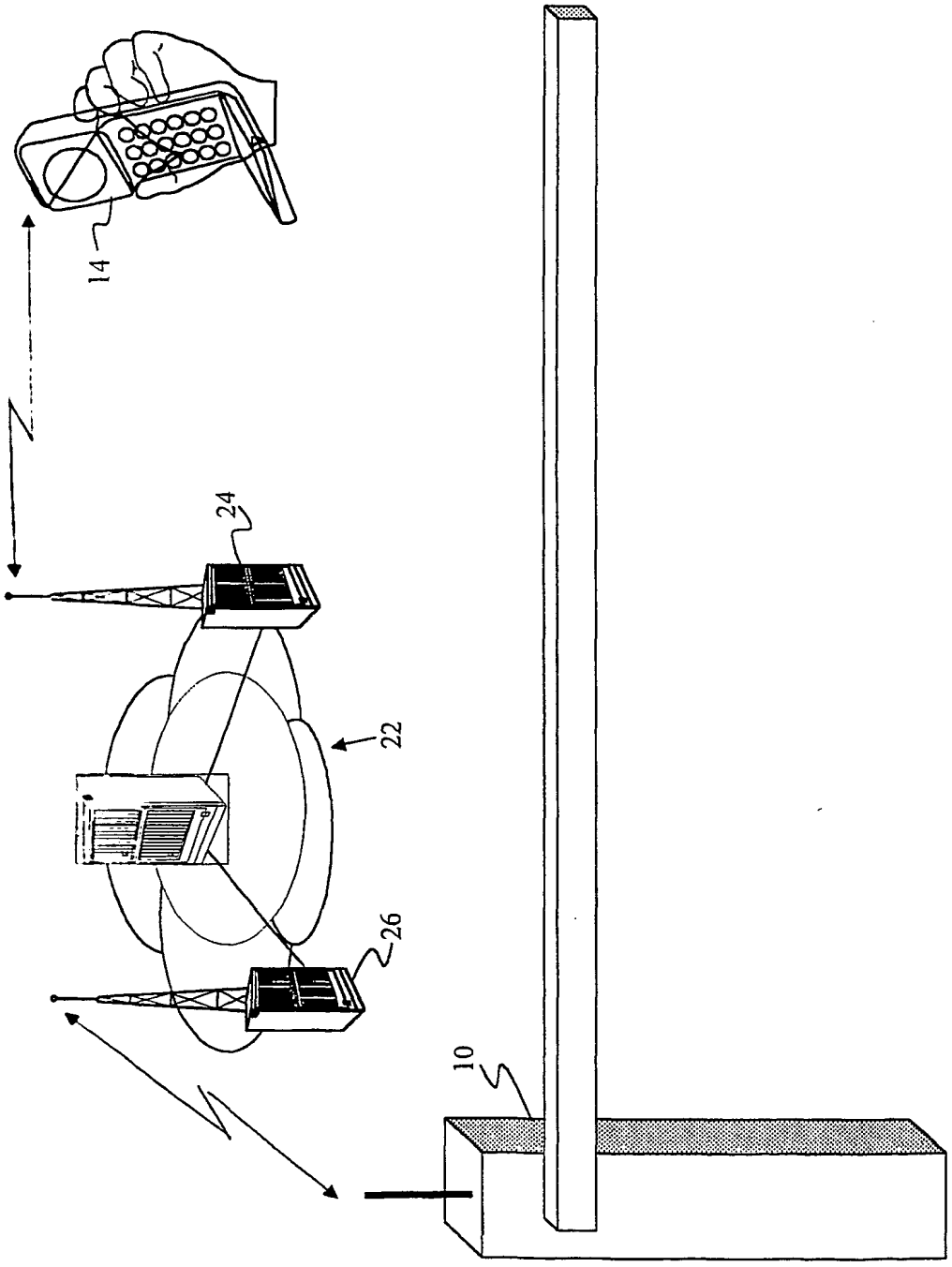


Fig. 1B

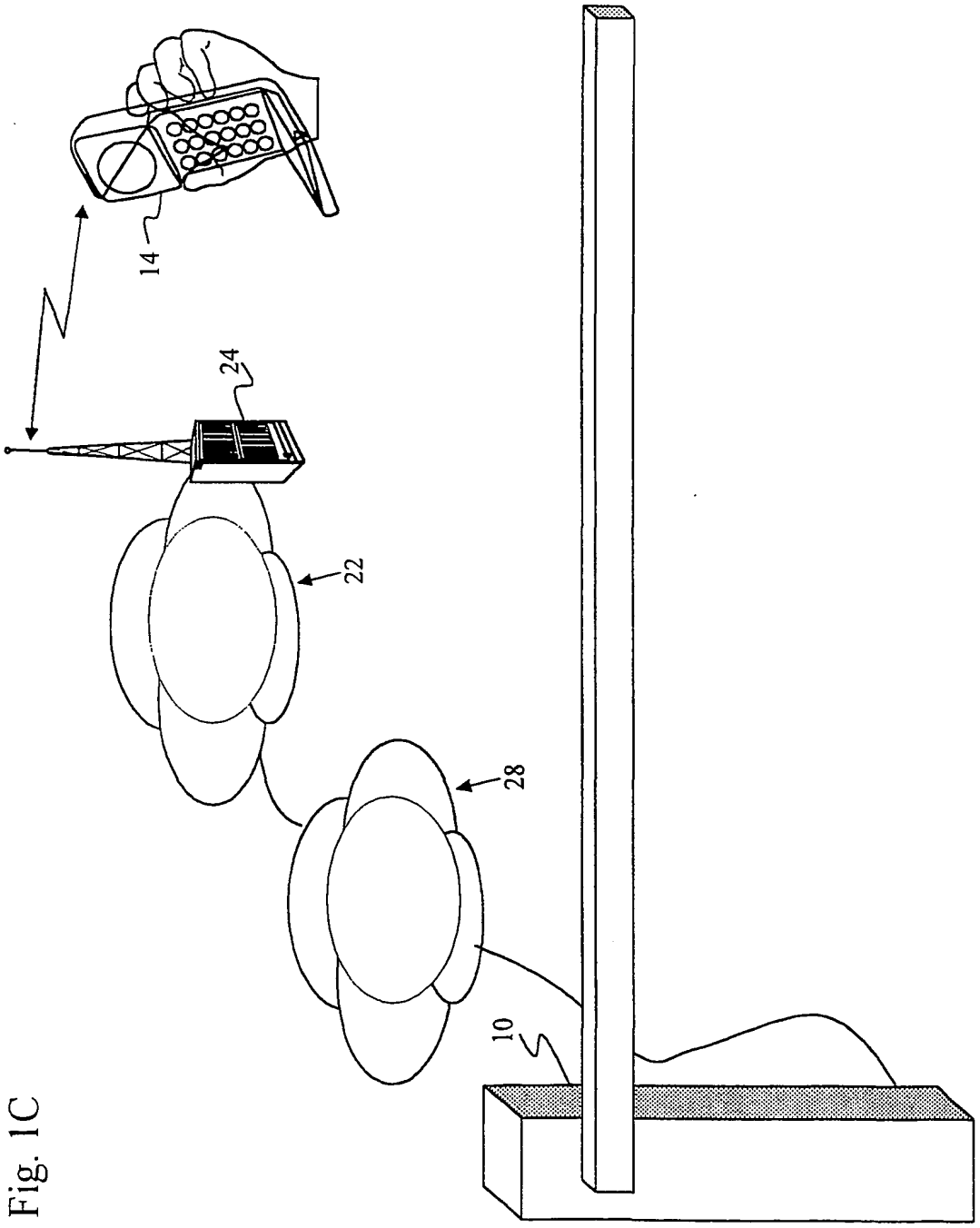


Fig. 1C

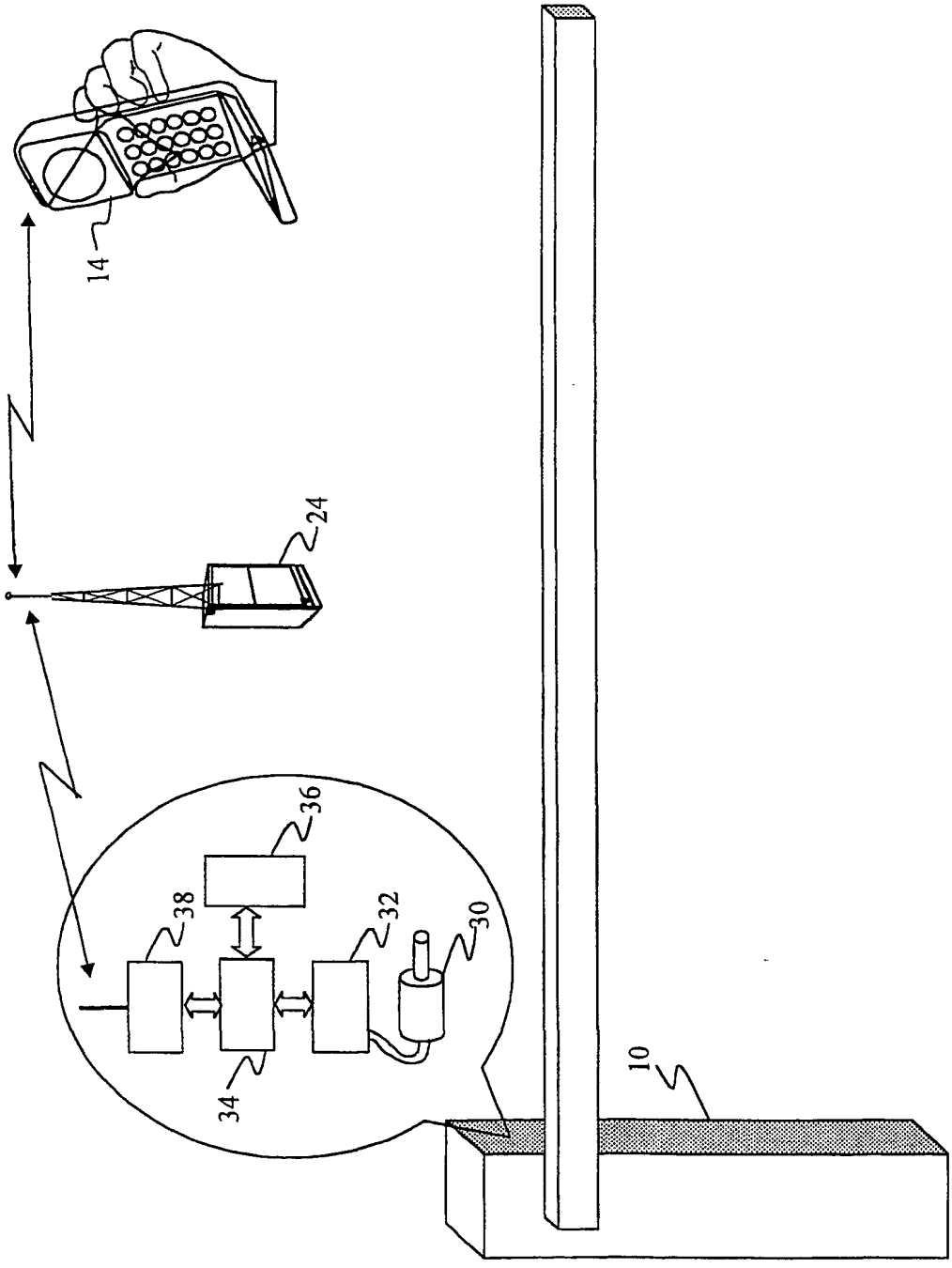


Fig. 2

Fig. 3B

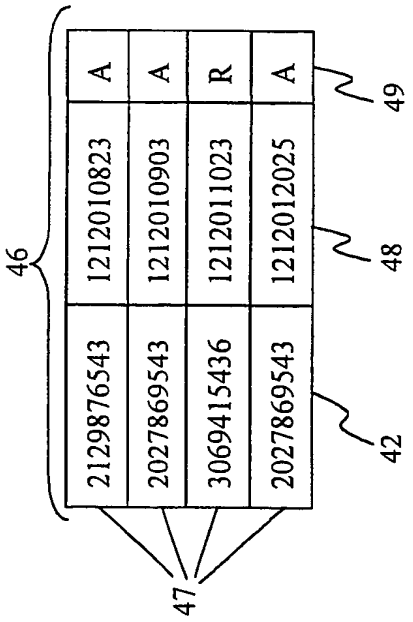


Fig. 3A

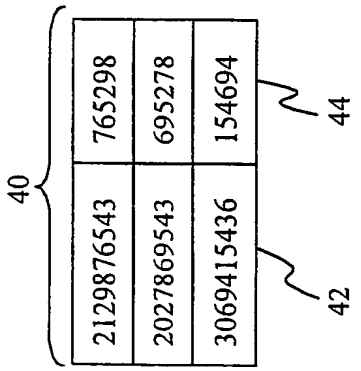
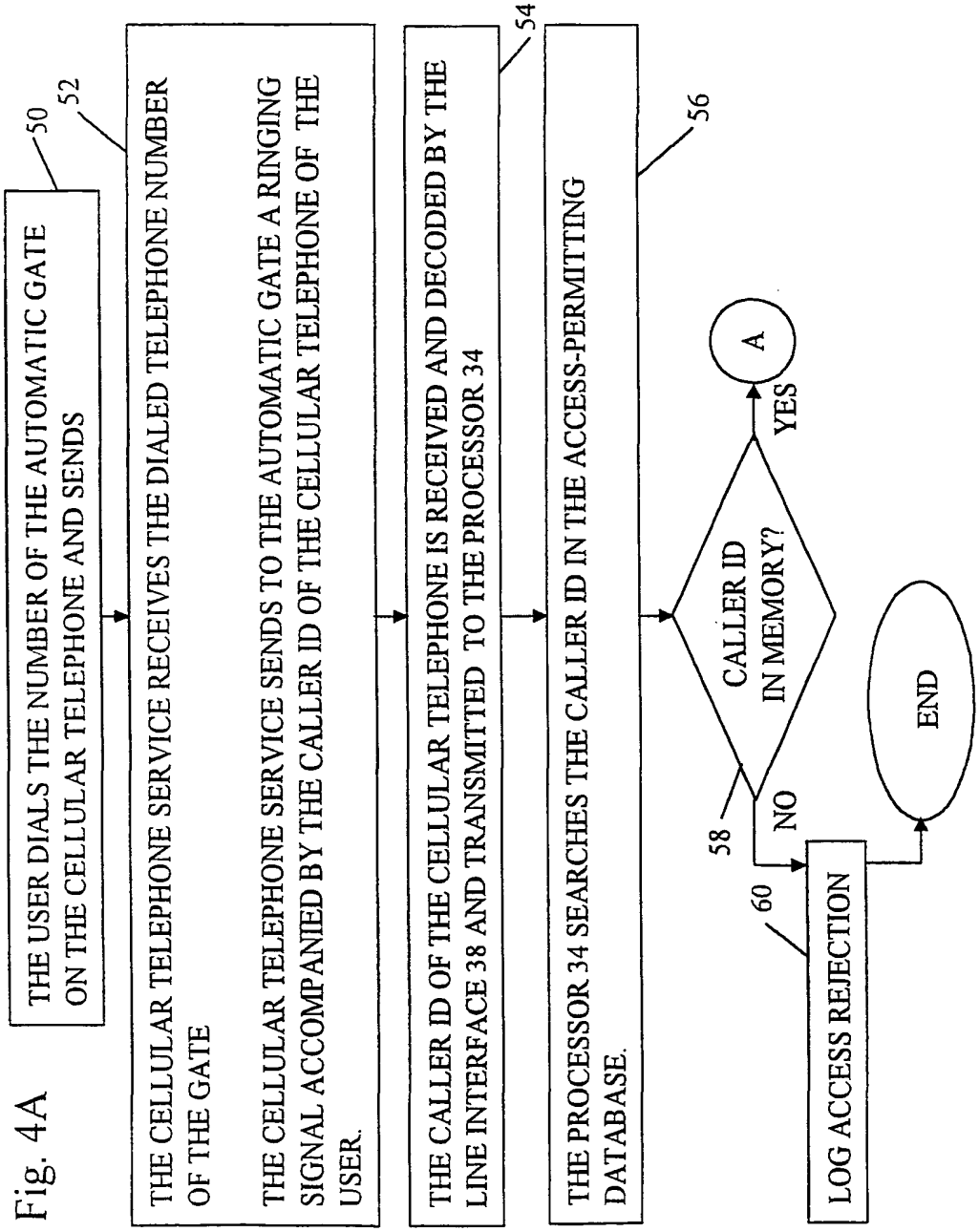


Fig. 4A



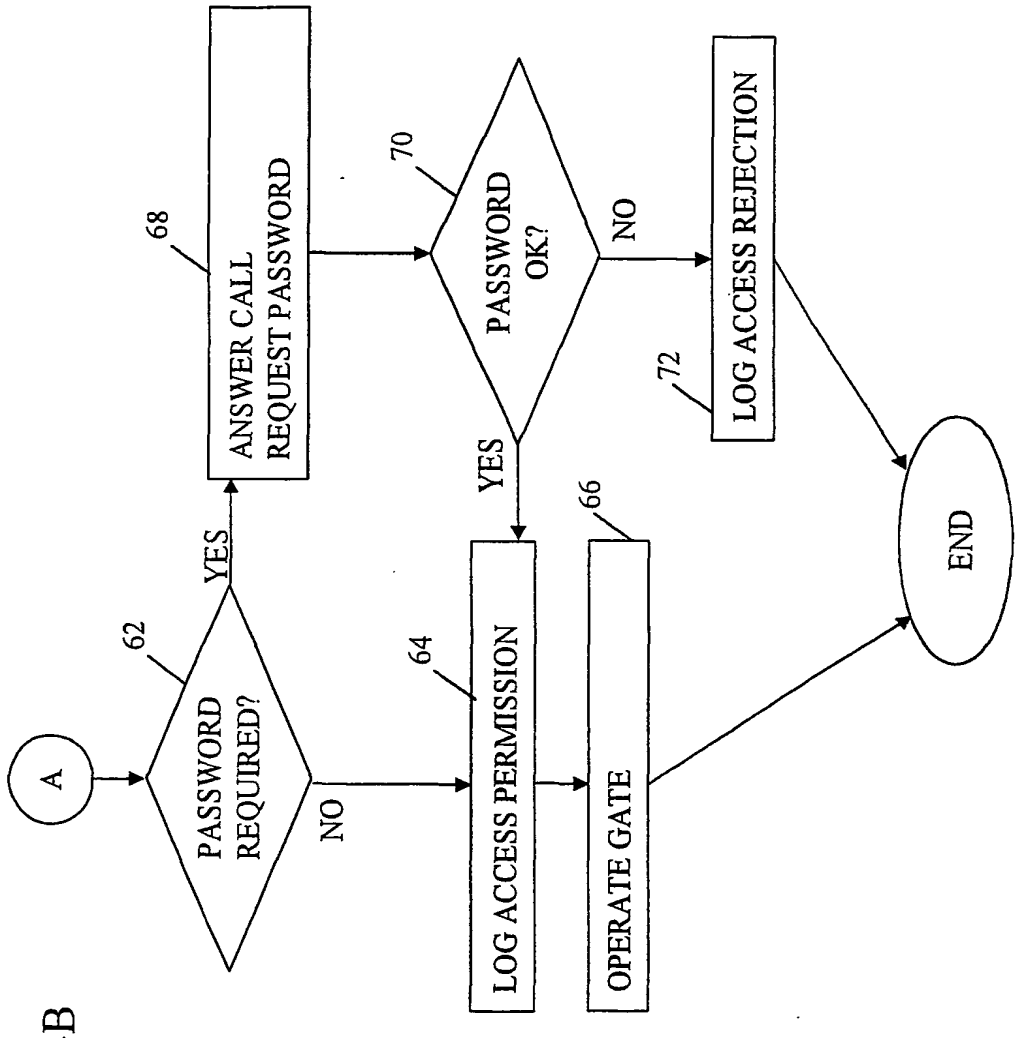


Fig. 4B

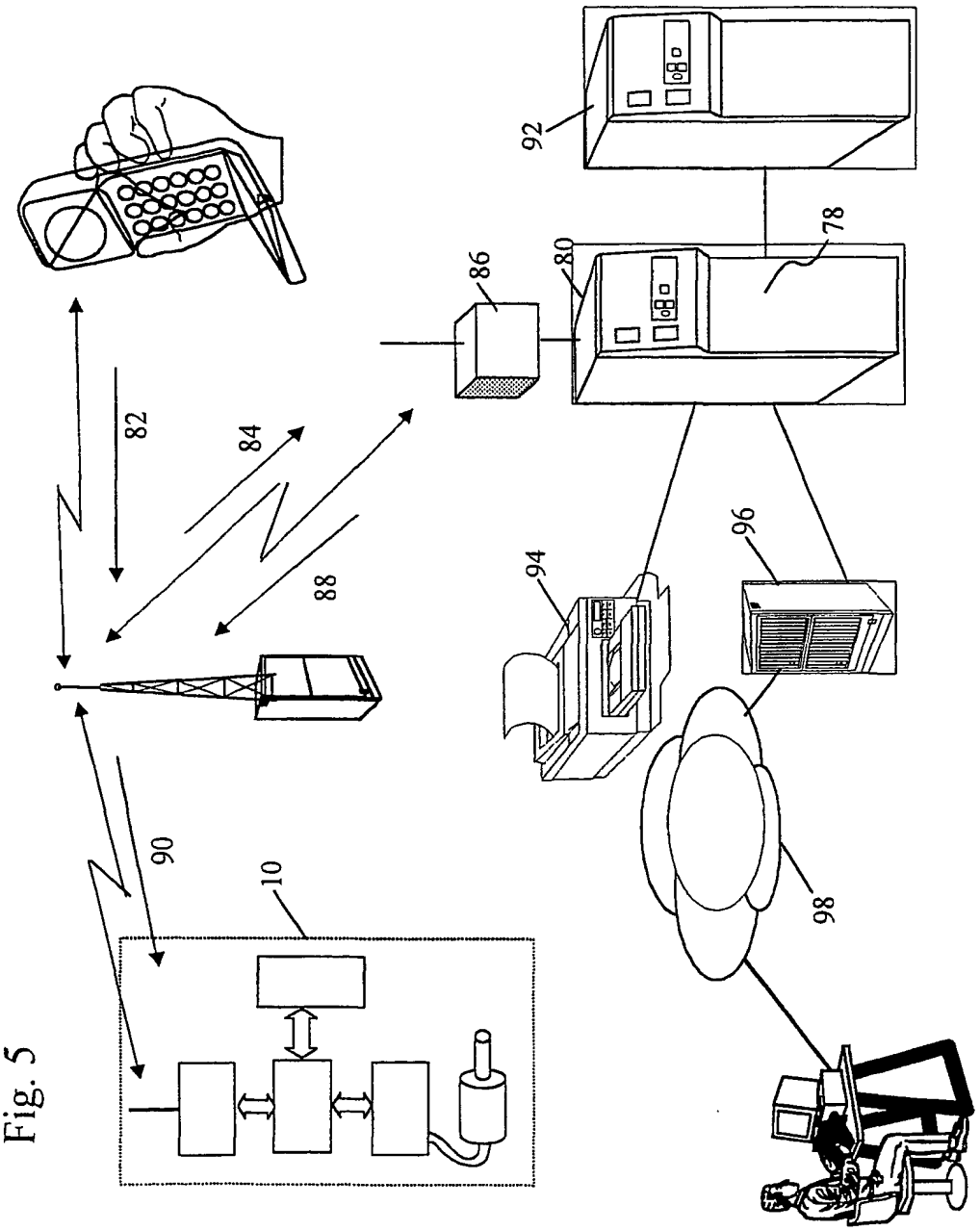


Fig. 5

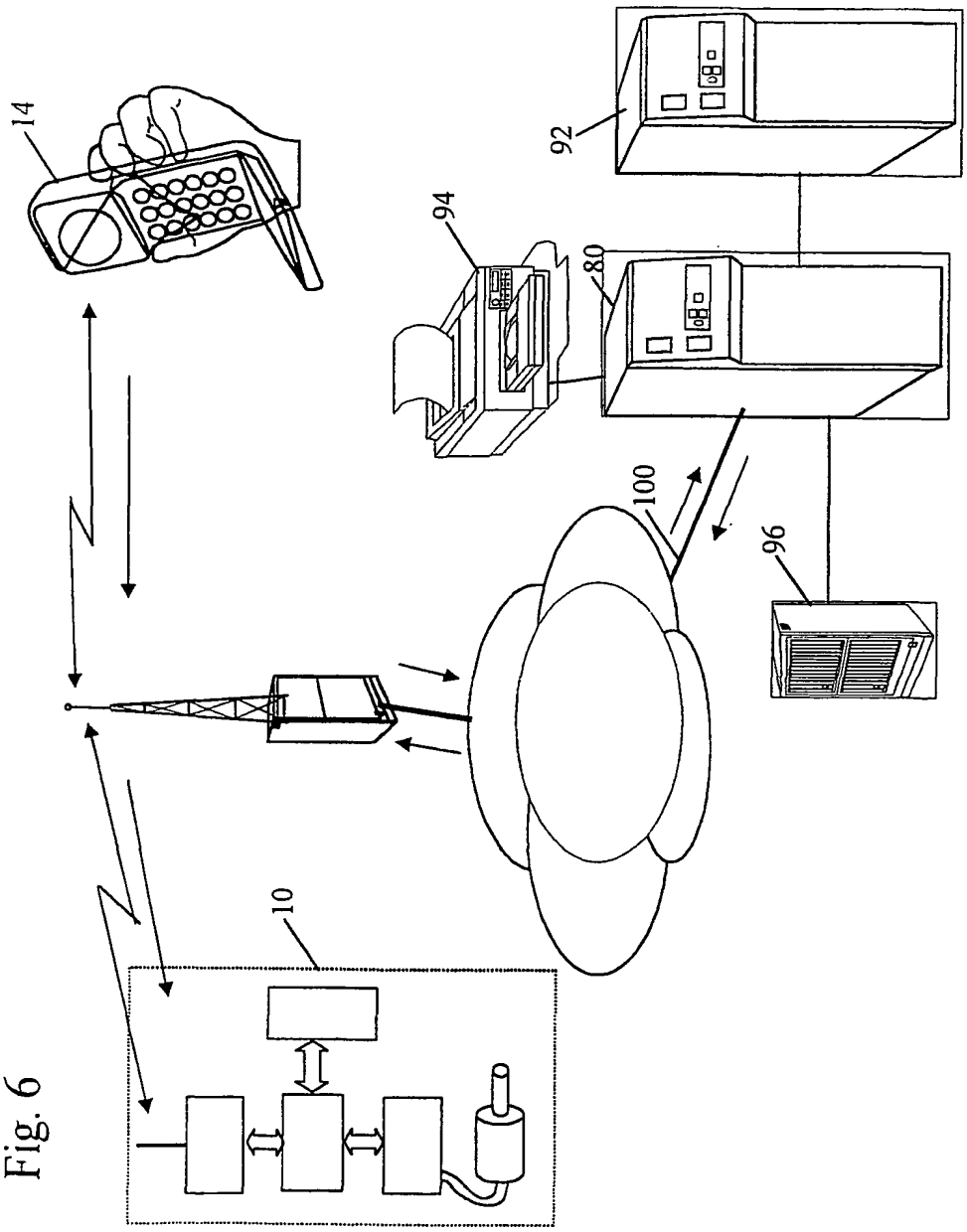


Fig. 6

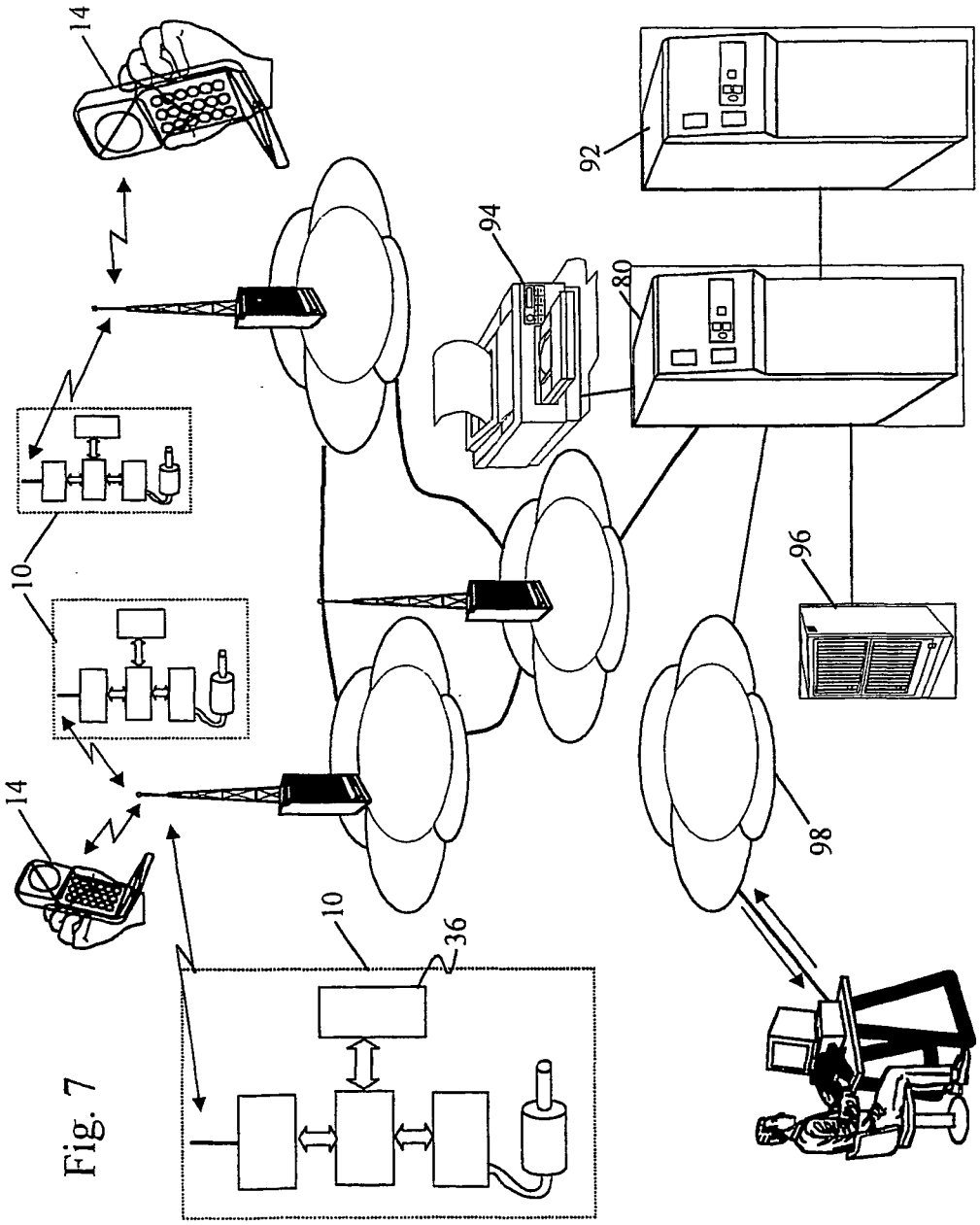


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL01/01153

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04B 7/00; G08G 1/07; G06F 17/30
US CL : 340/907; 455/33.1; 235/384; 709/232
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/907; 455/33.1; 235/384; 709/232

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,990,808 A (BAER) 23 November 1999, fig. 1-2, col. 2, lines 8-18, col. 4, lines 60-67, col. 5, lines 1-67, col. 6, lines 1-41	1-53
Y	US 5,414,249 A (MATSUMOTO) 09 May 1995, fig. 1, 3-4, col. 2, lines 43-68, col. 4, lines 11-68, col. 5, lines 1-28	1-53
Y	US 5,491,831 A (WILLIAM et al) 13 February 1996, fig. 1, col. 2, lines 3-28, col. 2, lines 55-67, col. 3, lines 1-49	1-3, 12-17, 26-31, 40-53
Y	US 6,047,327 A (TSO et al) 04 April 2000, fig. 1-2, col. 2, lines 54-67, col. 3, lines 1-48, col. 4, lines 15-67, col. 5, lines 1-12, col. 6, lines 46-63, col. 11, lines 19-67, col. 12, lines 1-67, col. 19, lines 47-59	

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
20 APRIL 2002

Date of mailing of the international search report
29 MAY 2002

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